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**Jameco Part Number 199873**

# *Resettable Fuse*
## *ERF SERIES*

## OVERVIEW

- ## TECHNOLOGY BASIC

Polymeric PTC resettable fuse devices synergistically integrate the advance polymer material technologies, conductive material science and novel processing engineering. Electrical resistance of such material and devices increases with increasing temperatures. When experiencing "over-current and/or over-voltage", the device generates thermal energy (Energy = I*V) and heats up itself. This makes its polymer matrix morphology change from crystalline to amorphous phase and results in a resistance increase of thousands of orders of magnitude such that "trip" the electricity. The device will remain hot and stay "tripped" until the fault is cleared and power is removed (Figure 1).

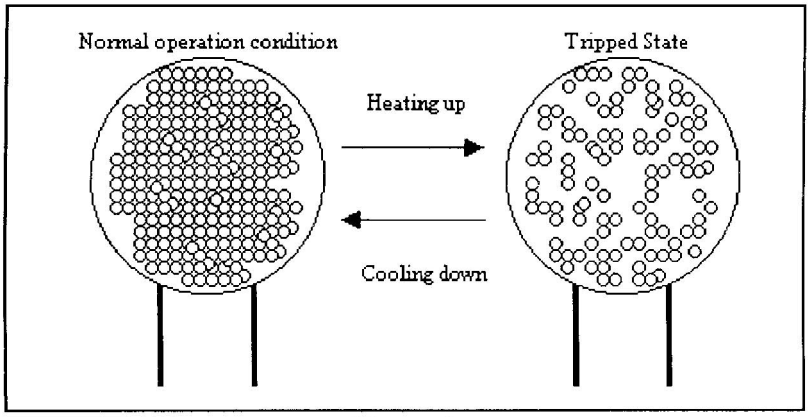
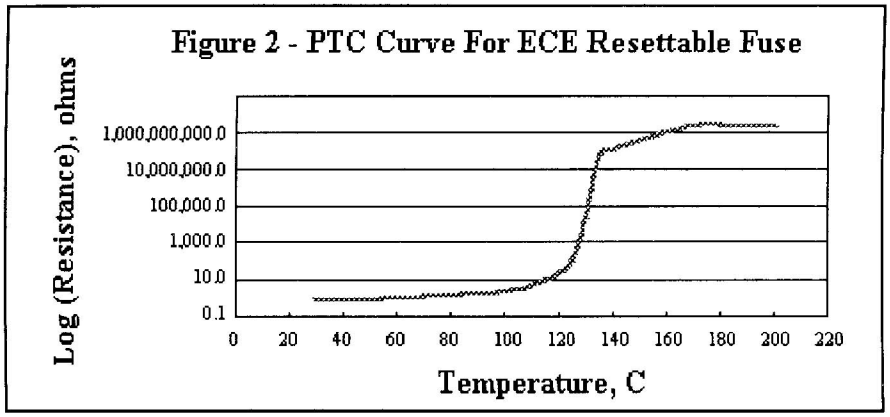


Figure 1

- ## WHAT IS A RESETTABLE FUSE?

Resettable fuses are made of patented novel polymeric PTC material in thin sheet form. With electrodes and leads attached on both sides, it is placed in a series to protect a circuit. At "normal operating condition" the device remains at an extremely low resistance (mini-ohms) and allows the electrical current flow thought it without any restriction. When over-current condition occurs, the polymeric PTC material heats up and its resistance increases sharply. Such a sharp resistance increase (to an insulated status) cuts off the current in the circuit, and consequently protects the element and device in the circuit. Upon the fault current being removed, the resettable fuse will be cooled and its resistance will drop to the original extremely low value. The fuse was "resetted" and allows the current through the circuit again.




- **HOLD CURRENT, TRIP CURRENT, AND THERMAL DERATING**

Hold current ($I_H$), and Trip current ($I_T$) of a resettable fuse are rated at $23^0$C. Typically its trip current is twice as much as its hold current. The fuse will not trip at its hold current or blow and will trip at or above its trip current. However, , due to the PTC effect both $I_T$ and $I_H$ reduces with ambient temperature increase and vice versa. As shown on fig.3, the currents are reduced nearly 50% at $85^0$C and increased to 150% at $-40^0$C.

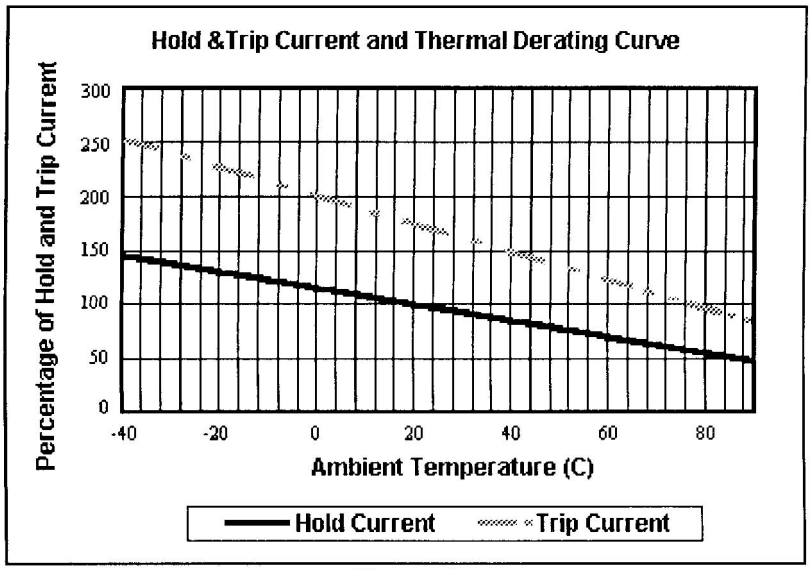



Figure 3

# RADIAL LEADED PTC

- Radial leaded devices being lower hold current, solid state
- Operation current: 100mA ~ 3.75A
- Maximum voltage: 60V
- Temperature range: -40$^0$C to 85$^0$C
- Cured, flame retardant epoxy polymer insulating material meets UL 94V-0 requirement

# APPLICATIONS

Ideal for low voltage power supply with a load to be protected:

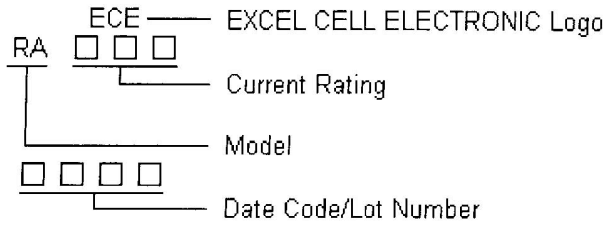
- Computers and peripherals
- Security and fire alarm system
- General electronics
- Loud speakers
- Automotive applications
- Power Transformers

## Part Numbering System:

(1)ERF (2)XX (3)XXX (4)XX (5)X (6)X

1. Product Name
2. Model: RA – radial leaded devices, low hold current
3. Current rating
4. Voltage rating
5. Packing type
6. Special number

Example




***If the current rating is under 1Amp there will be no "ECE" logo shown on the body.**

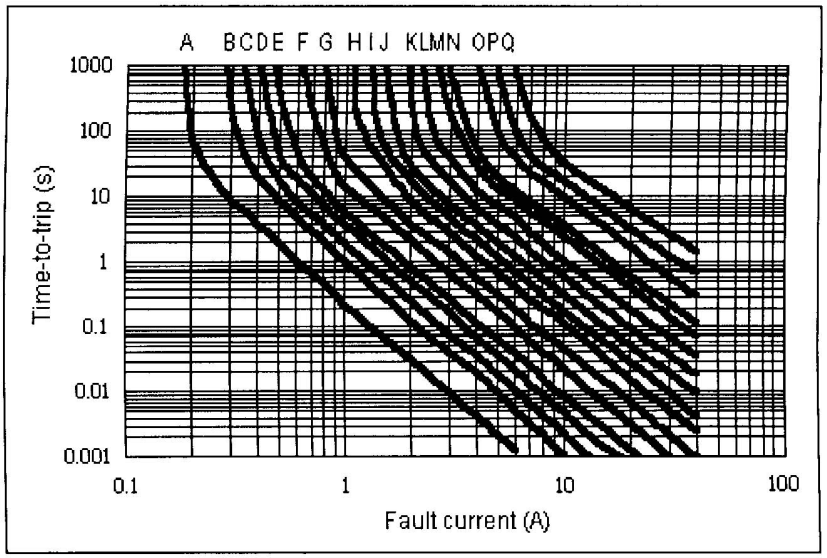
## Electrical Characteristics (23$^0$C)

| Part No. | Hold Current | Trip Current | Max. Time to Trip | Max. Current | Rated Voltage | Pd | Resistance Tolerance | |
|---|---|---|---|---|---|---|---|---|
| | $I_H$, A | $I_T$, A | @5x $I_H$ | $I_{MAX}$, A | $V_{MAX}$, V | W | $R_{MIN}$ (Ω) | $R1_{MAX}$ (Ω) |
| RA010-60 | 0.10 | 0.20 | 4.0 | 40 | 60 | 0.38 | 2.50 | 7.50 |

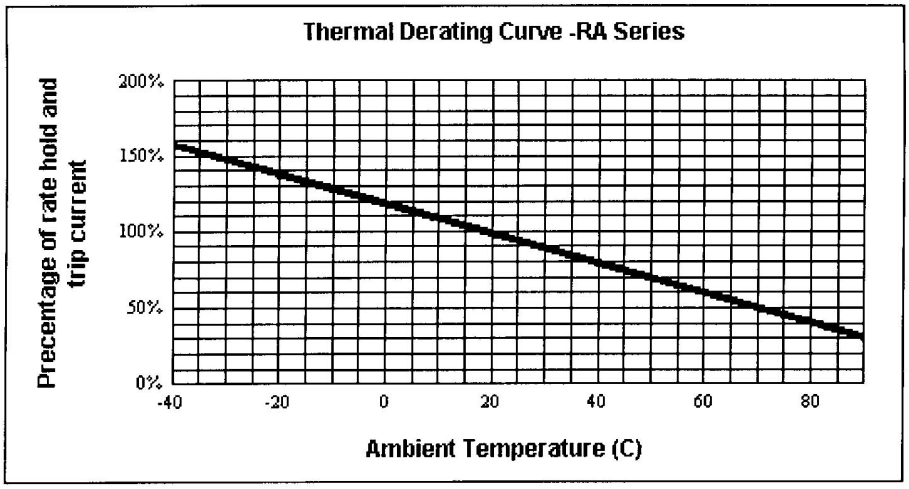
| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| RA017-60 | 0.17 | 0.34 | 3.0 | 40 | 60 | 0.48 | 2.00 | 7.00 |
| RA020-60 | 0.20 | 0.40 | 2.2 | 40 | 60 | 0.41 | 1.83 | 4.40 |
| RA025-60 | 0.25 | 0.50 | 2.5 | 40 | 60 | 0.45 | 1.25 | 3.00 |
| RA030-60 | 0.30 | 0.60 | 3.0 | 40 | 60 | 0.49 | 0.88 | 2.10 |
| RA040-60 | 0.40 | 0.80 | 3.8 | 40 | 60 | 0.56 | 0.55 | 1.29 |
| RA050-50 | 0.50 | 1.00 | 4.0 | 40 | 60 | 0.77 | 0.50 | 1.17 |
| RA065-60 | 0.65 | 1.30 | 5.3 | 40 | 60 | 0.88 | 0.31 | 0.72 |
| RA075-60 | 0.75 | 1.50 | 6.3 | 40 | 60 | 0.92 | 0.25 | 0.60 |
| RA090-60 | 0.90 | 1.8 | 7.2 | 40 | 60 | 0.99 | 0.20 | 0.47 |
| RA110-60 | 1.10 | 2.20 | 8.2 | 40 | 60 | 1.50 | 0.15 | 0.38 |
| RA135-60 | 1.35 | 2.70 | 9.6 | 40 | 60 | 1.70 | 0.12 | 0.30 |
| RA160-60 | 1.60 | 3.20 | 11.4 | 40 | 60 | 1.90 | 0.09 | 0.22 |
| RA185-60 | 1.85 | 3.70 | 12.6 | 40 | 60 | 2.10 | 0.08 | 0.19 |
| RA250-60 | 2.50 | 5.00 | 15.6 | 40 | 60 | 2.50 | 0.05 | 0.13 |
| RA300-60 | 3.00 | 6.00 | 19.8 | 40 | 60 | 2.80 | 0.04 | 0.10 |
| RA375-60 | 3.75 | 7.50 | 24.0 | 40 | 60 | 3.20 | 0.03 | 0.08 |

$I_H$ – Hold current-maximum current at which the device will not trip at $23^0$C still air
$I_T$ – Trip current-minimum current at which the device will always trip at $23^0$C still air
$V_{MAX}$ – Maximum voltage device can withstand with out damage at rated current
$I_{MAX}$ – Maximum fault current device can withstand without damage at rated voltage ($V_{MAX)}$
Pd – Typical power dissipated from device when in the tripped state in $23^0$C still air environment
$R_{MIN}$ – Minimum device resistance at $23^0$C
$R1_{MAX}$ – Maximum device resistance at $23^0$C 1 hour after tripping

A=RA010-60
B=RA017-60
C=RA020-60
D=RA025-60
E=RA030-60
F=RA040-60
G=RA050-60
H=RA065-60
I=RA075-60
J=RA090-60
K=RA110-60
L=RA135-60
M=RA160-60
N=RA185-60
O=RA250-60
P=RA300-60
Q=RA375-60

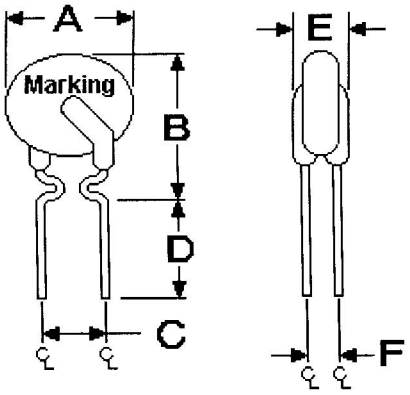


## Thermal Derating Curve



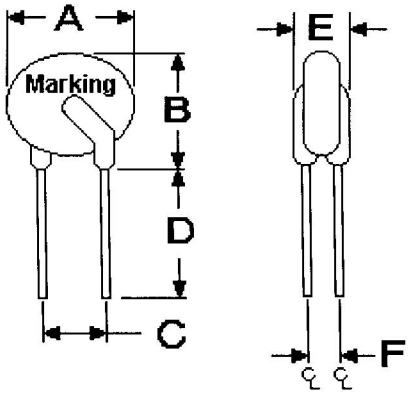

# RA Product Dimensions (UNIT: mm)

| Part No. | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| | Maximum | Maximum | Typical | Minimum | Minimum | Typical |
| RA-010-60 | 7.4 | 12.7 | 5.1 | 7.6 | 3.1 | 1.1 |
| RA-017-60 | 7.4 | 12.7 | 5.1 | 7.6 | 3.1 | 1.1 |
| RA-020-60 | 7.4 | 12.2 | 5.1 | 7.6 | 3.1 | 1.1 |
| RA-025-60 | 7.4 | 12.7 | 5.1 | 7.6 | 3.1 | 1.1 |
| RA-030-60 | 7.4 | 13.0 | 5.1 | 7.6 | 3.1 | 1.1 |
| RA-040-60 | 7.6 | 13.5 | 5.1 | 7.6 | 3.1 | 1.1 |
| RA-050-60 | 7.9 | 13.7 | 5.1 | 7.6 | 3.1 | 1.1 |
| RA-065-60 | 9.7 | 14.5 | 5.1 | 7.6 | 3.1 | 1.1 |
| RA-075-60 | 10.4 | 15.2 | 5.1 | 7.6 | 3.1 | 1.1 |
| RA-090-60 | 11.7 | 15.8 | 5.1 | 7.6 | 3.1 | 1.1 |
| RA-110-60 | 13.0 | 18.0 | 5.1 | 7.6 | 3.1 | 1.4 |
| RA-135-60 | 14.5 | 19.6 | 5.1 | 7.6 | 3.1 | 1.4 |
| RA-160-60 | 16.3 | 21.3 | 5.1 | 7.6 | 3.1 | 1.4 |
| RA-185-60 | 17.8 | 22.9 | 5.1 | 7.6 | 3.1 | 1.4 |
| RA-250-60 | 21.3 | 26.4 | 10.2 | 7.6 | 3.1 | 1.4 |
| RA-300-60 | 24.9 | 30.0 | 10.2 | 7.6 | 3.1 | 1.4 |
| RA-375-60 | 28.5 | 33.5 | 10.2 | 7.6 | 3.1 | 1.4 |




RA 010-60 ~ RA 090-60

- Lead Size: 24AWG
- Ø 0.51 mm Diameter




RA 110-60 ~ RA 375-60

- Lead Size: 20AWG
- Ø 0.81 mm Diameter